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VERSATILE COMMUNICATIONS CONNECTORS

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see p. 17

BACKGROUND

The Field of the Invention.

This invention relates to electronic communication
5 devices. More particularly, the present invention relates to
connectors used to attach a communications line to a computer.

The Background Art.

Telecommunications services have become an integral part
10 of modern society. The number of telephones in the United
States alone exceeds 150 million. Moreover, communications
within an organization between people and machines further
increases the size of the communications network. The vast
majority of the communications devices now in use require a
15 wired connection to a communications line. Such
communications devices include, for example, telephones,
facsimile machines, modems, and local area network (LAN)
adapters. Wireless communications, however, are becoming more
commonplace in many instances.

20 In order to conveniently attach a communications line to
a communications device, standard connectors have been
promulgated. The most popular of these connectors is known in

the art as the RJ-xx series of connectors. Of the RJ-xx series of connectors, the RJ-11, RJ-12, and RJ-45 connectors are widely used. The RJ-11 connector comprises a six contact plug and a corresponding jack which is standardized in the industrialized world. The conventional six contact RJ-11 connector has the desirable attributes of having both low cost and high reliability.

The RJ-xx series of connectors, mostly the RJ-11 connector, is commonly used to attach a communications device such as a telephone, facsimile machine, or a modem (all of which may be integrated into a single device) to a communications line. Such devices are becoming smaller, so small that one or more dimensions of the customary RJ-11 jack, also referred to as a receptacle, is larger than a corresponding dimension of communications device. For example, communication devices which comply with the Personal Computer Memory Card International Association (PCMCIA), also referred to as PC Card, standards have dimensions of about 2.1 inches by about 3.4 inches with a thickness of only 3.5mm, 5mm, 8mm, or 10.5mm. Such small communications devices cannot incorporate customary RJ-xx series receptacles but still

require compatibility with RJ-xx series plugs in order to attach to a communications line.

U.S. Patent No. 5,183,404 to Aldous provides several schemes for providing a miniature RJ-11 compatible receptacle.

5 Disadvantageously, many of the schemes set forth in Aldous leave the electrical contacts exposed to the surrounding environment. Thus, a user may come in contact with the electrical contacts of the plug, which in the U.S. may carry more than 80 volts. Further, since the contacts of the RJ-11
10 plug are exposed, the contacts may be inadvertently shorted together. Thus, the scheme included in the Aldous reference presents a danger of electrical shock and electrical short circuit. Moreover, some of the receptacle schemes disclosed in the Aldous reference are particularly prone to breakage and
15 damage because of inherently weak structures.

Thus, it would be an advance in the art to provide a miniaturized communications connector which overcomes these drawbacks.

BRIEF SUMMARY AND OBJECTS OF THE INVENTION

In view of the above described state of the art, the present invention seeks to realize the following objects and advantages.

5 It is a primary object of the present invention to provide a communications line receptacle for use with a miniaturized communications device wherein the electrical contacts are shielded or isolated from the surrounding environment.

10 It is also an object of the present invention to provide a miniaturized communications line connector which is resistant to breakage and which can be stored out of the way when not being used.

15 It is a further object of the present invention to provide a communications line receptacle which is readily replaceable if broken.

 It is another object of the present invention to provide a communications card which can be readily adapted to meet various communications standards.

It is a further object of the present invention to provide a communications card which can provide wireless communications.

These and other objects and advantages of the invention will become more fully apparent from the description and claims which follow, or may be learned by the practice of the invention.

The present invention provides an apparatus for receiving an RJ-xx series plug and making electrical connection with at least two conductors on the plug and conveying any signals on the conductors to a communications device such as a telephone, facsimile machine, modem, local area network adapter, or some other device.

The apparatus includes a body, also referred to as a body means. A recess, or recess means, is provided on the body. In some embodiments the recess means preferably includes an open first end and a closed second end. In other embodiments, the recess means preferably includes open first and second ends. The recess means preferably has dimensions such that the plug is closely received therein. A means is also

provided for releasably engaging the plug such that the plug is releasably held in the recess.

At least first and second electrical conductors are provided in the recess. Each of the electrical conductors are positioned such that they have electrical continuity with the electrical contacts in the plug when the plug is received into the recess. A means for conveying any electrical signal present on the electrical contacts to the communications device is also provided.

A replaceable direct access arrangement unit allows the communications card to be interfaced with telephone systems, or other communications systems, which may each require adherence to a different standard. When necessary, a user merely replaces an existing direct access arrangement unit with another direct access arrangement unit which is compatible with the wired telephone system or the wireless communications system that is available to the user.

Also preferably included with the recess means is an expandable means for isolating the contacts in the plug from electrical continuity with an object in a surrounding environment such that passage of current from one or more of

the electrical contacts to an object present in the surrounding environment is prevented. The expandable means is located at the second end of the recess and is preferably a stretchable membrane. The expandable means expands to
5 accommodate a plug received in the recess and tends to return, and can be returned by a user, to a position within the thickness of the body when not being used so the apparatus assumes a compact configuration.

Embodiments of the present invention include receptacle
10 modules which receive an RJ-xx series plug. One preferred embodiment of the present invention includes a means for holding the body which receives the RJ-xx series plug. The means for holding the receptacle body or the receptacle module can be easily installed in and removed from the communications
15 device by the user. The present invention allows the body to be retracted into and extended from the communications device while still allowing easy removal and replacement of the body making up the receptacle module. Another preferred embodiment of the present invention includes means for pivotally rotating
20 the body into and out of the communications device such that the body is substantially entirely within the communications

device when not being used and the body is rotated to a position where the recess which receives the plug is accessible to the user when desired.

BRIEF DESCRIPTION OF THE DRAWINGS

5 In order to better appreciate how the above-recited and other advantages and objects of the invention are obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings.

10 Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

15 Figure 1 is a partial perspective view of a lap top computer with a communications card partially inserted therein and a first embodiment of the present invention ready to be coupled to the communications card.

 Figure 2 is a cross sectional view of the first
20 embodiment of the present invention represented in Figure 1.

Figure 3 is a reverse perspective view of the first embodiment of the present invention represented in Figure 1.

Figure 4 is a perspective view of a second embodiment of the present invention with a receptacle module illustrated in a retracted position.

Figure 5 is a perspective view of the second embodiment of the present invention represented in Figure 4 illustrated in an extended position.

Figure 6 is a perspective view of a third embodiment of the present invention with a removable receptacle module illustrated in a retracted position.

Figure 7 is a perspective view of the third embodiment of the present invention represented in Figure 6 with the removable receptacle module illustrated in an extended position.

Figure 8 is a top plan view of the removable receptacle module represented in Figure 7.

Figure 9 is a top plan view of the removable receptacle module represented in Figure 6.

Figure 10 is a perspective view of a fourth embodiment of the present invention with the receptacle module illustrated in a retracted position.

Figure 11 is a perspective view of the fourth embodiment
5 of the present invention represented in Figure 10 with the receptacle module illustrated in an extended position.

Figure 12 is a perspective view of a fifth embodiment of the present invention.

Figure 13 is a side elevational view of the fifth
10 embodiment of the present invention represented in Figure 12.

Figure 14 is a perspective view of a sixth embodiment of the present invention having a replaceable direct access arrangement unit ready to be inserted into the communications card.

15 Figure 14A is an end view taken along line 14A-14A of Figure 14.

Figure 14B is a perspective view of the embodiment illustrated in Figure 14 showing the components retracted into the communications card.

Figures 14C-E are block diagrams illustrating the preferred functions carried out by the replaceable direct access arrangement unit.

Figure 14F is a top view of a communications card having another replaceable direct access arrangement unit installed therein.

Figures 15A and 15B are top views showing the electrical interconnection between the receptacle module and the replaceable direct access arrangement (not shown in these figures) and the accompanying mechanism which retracts and extends the receptacle module into and out of the replaceable direct access arrangement.

Figure 15C is a detailed side view of the electrical interconnection circuit between the receptacle module and the frame.

Figure 15D is a detailed perspective view of the electrical interconnection circuit between the receptacle module and the frame.

Figures 16A, 16B and 16C are side views, and Figure 16D is a top view, of a mechanism which functions to retract and

extend the receptacle module into and out of the replaceable direct access arrangement.

Figures 17A and 17B are top views showing the electrical interconnection between the receptacle module and the replaceable direct access arrangement and the accompanying mechanism which retracts and extends the receptacle module into and out of the replaceable direct access arrangement.

Figure 17C is a detailed perspective view of the electrical interconnection circuit between the receptacle module and the frame represented in Figures 17A-B.

Figures 18A and 18B are top and side views, respectively, of a mechanism which functions to retract and extend the receptacle module into and out of the replaceable direct access arrangement.

Figures 19A-C are perspective views of three different antenna configurations which may be included in embodiments of the present invention.

Figure 20 is a perspective view of an embodiment of the present invention which is adapted for use with a portable cellular telephone.

Figure 21 is a perspective view of a communications card in accordance with the present invention having an RJ-xx series receptacle placed directly in the end thereof.

Figure 21A is a perspective view of another communications card in accordance with the present invention having an RJ-xx series receptacle placed directly in the end thereof.

Figure 22 is a perspective view of a communications card in accordance with the present invention having a plurality of RJ-xx series receptacles with pivoting covers positioned in an end thereof.

Figure 23 is a perspective view of a communications card in accordance with the present invention having a plurality of RJ-xx series receptacles located in sliding drawers positioned on the end of the communications card.

Figure 24A is a perspective view of a communications card in accordance with the present invention having a plurality of RJ-xx series receptacles positioned in sliding drawers with each drawer provided with a movable bottom.

Figure 24B is a cross sectional view taken along line 24B-24B of Figure 24A.

Figure 25 is a perspective view of a communications card in accordance with the present invention having a plurality of RJ-xx series receptacles each including a pair of retractable expanding jaws.

5 Figure 26A is a partial perspective view of a communications card in accordance with the present invention having two different connector receptacles positioned on a retractable member shown in an extended position.

10 Figure 26B is a partial perspective view of the communications card represented in Figure 26A with the retractable member shown in a retracted position.

15 Figure 27 is a partial perspective view of a communications card in accordance with the present invention having three RJ-xx series receptacles positioned on a rotatable and retractable member shown in an extended position.

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20 Figure 28 is a perspective view of a communications card in accordance with the present invention having two RJ-xx series receptacles positioned in a retractable shell member shown in an extended position.

Figures 29A&B are a perspective view and a top view, respectively, of a communications card in accordance with the present invention having two RJ-xx series receptacles positioned on a pivoting and retractable member shown in an
5 extended position.

Figures 30A&B are perspective views of a communications card in accordance with the present invention including three RJ-xx series receptacles positioned on an end of the communications card with a shell member shown in a compact
10 configuration in Figure 30A and shown in a an extended configuration in Figure 30B ready to receive one, two, or three RJ-xx series plugs.

Figures 31A&B are perspective views of a communications card in accordance with the present invention including three
15 RJ-xx series receptacles and a memory card operatively and removably received into the communications card.

Figures 32A&B are perspective views of a PC card in accordance with the present invention which operatively receives a magnetic disk storage medium.

Figure 33 is a perspective view of a PC card in accordance with the present invention including two memory cards which are operatively received into the PC card.

Figure 34A is a perspective view of a communications card
5 in accordance with the present invention including three RJ-xx series receptacles positioned on an end of the communications card with retracting bails, shown in phantom image, which individually hold an RJ-xx series plug in an operative position.

10 Figure 34B is a detailed perspective view of the operative structures represented in Figure 34A.

15 Figure 35 is a perspective view of a communications card in accordance with the present invention which includes a retractable member providing two RJ-xx series receivers with pivoting bails which hold respective RJ-xx series plugs in operative positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made to the drawings wherein like structures will be provided with like reference designations.

20 U.S. Patent Applications serial nos. 08/799,799, filed February 13, 1997 and 08/971,501, filed November 17, 1998,

both of which are now incorporated by reference herein in their entireties.

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As is evident to those skilled in the art, advances in technology is allowing many different electrical devices to be made smaller than was contemplated just a few years ago. Represented in Figure 1 is a partial perspective view of a lap top computer 8. In order to meet the demand for devices utilized with such lap top computers without adding any significant weight or bulk, devices such as a modem card 118 (shown partially withdrawn from the lap top computer 8) which complies with the PCMCIA (also known as PC Card) standards have been produced. Significantly, while most lap top computers are generally note book size (about 8.5 inches by about 11 inches) or smaller, the need for further miniaturization of devices such as the modem card 118 will increase as computing devices of all kinds continue to shrink.

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The lap top computer 8 represented in Figure 1 includes a PCMCIA compliant socket 124. The Personal Computer Memory Card International Association (PCMCIA) promulgates the PCMCIA standard which has gained wide acceptance in the industry. It is preferred that the PCMCIA compliant socket adhere to PCMCIA

standard pertaining to Type I, Type II, and Type III cards. The preferred standards specify the physical, electrical and environmental parameters which compliant devices must meet. The system and method of the present invention described
5 herein are preferably compatible with the PCMCIA Card Services Specification 2.1 and Card Services Specification 2.1 as well. This standard and the accompanying specifications are well-known in the art and PCMCIA release 2.1, PCMCIA Card Services Specification 2.1, and Card Services Specification 2.1, PCMCIA
10 Standard Release 2.1, and all releases promulgated thereafter (including the PC Card standard (1995)), are now all incorporated by reference herein in their entireties. It is to be understood that the present invention can be utilized with other PCMCIA specifications and standards which are now
15 available or which become available in the future as well as with other similarly instructive standards which are now available in the industry or which become available in the future. Examples of such other specifications and standards include the CardBus PC Card standard which is also now
20 incorporated herein by reference in its entirety. Further information regarding the implementation of these standards

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can be obtained from the publication Anderson, D. & Shanley,
T., CardBus System Architecture (1996) (published by Addison-
Wesley Publishing Company) which is also now incorporated
herein in its entirety.

5 The modem card 118 shown in Figure 1 can also represent
numerous other communication devices, for example, a local
area network adaptor, voice mail device, telephonic
communication device, or a facsimile device. Indeed, with the
continuing trend of miniaturizing such devices, all of these
10 devices may be combined into one card the size of the modem
card 118 represented in Figure 1. All of these devices are
examples of those intended to come within the scope of the
meaning of the term "communication device" as used herein.
Even further, other devices which require communication with
15 one or more additional devices which are now available or
which may become available in the future are intended to also
come within the meaning of the term communication device as
used herein.

As used herein, the term "data utilization device" is
20 intended to include all digital computing devices which are
adaptable to receive data or instructions via a communications

medium. Perhaps the most common current example of such a device is the personal computer.

A plug, which is compatible with the RJ-xx series industry standard, is indicated generally at 10 in Figures 1, 2, and 3. The RJ plug 10 includes a block 11 which has a first face 16 into which a plurality of electrical contacts 20 are recessed. The electrical contacts 20 are connected to wires (not explicitly represented in Figures 1-3) contained within a cable 14 which lead to the communications network, to another communications device, or some other device. A biased clip 12, which is integrally molded as part of the block 11, is used to hold the plug 10 in a corresponding receptacle.

Detailed information regarding the RJ-xx series of connectors can be found in the publication found at Title 47 (Telecommunications), Code of Federal Regulations, Chapter I (Federal Communications Commission), Subchapter B (Common Carrier Services), Part 68 (Connection of Terminal Equipment to the Telephone Network), Subpart F (Connectors), Section 68.500 (1992) which is now incorporated herein by reference in its entirety.

Figures 1-3 represent a first preferred arrangement of the present invention embodied in a receptacle module generally represented at 100. The receptacle module 100 includes a male coupling 112 which provides both physical and electrical connections to a corresponding female coupling 120 provided in the modem card 118. It will be appreciated that many different structures available in the industry provide equivalent functions to the male coupling 112 and the female coupling 120.

The receptacle module 100 includes a body 102 which can preferably be fabricated from a plastic material using techniques known in the art but can also be fabricated using any suitable materials and techniques now available or which may become available in the future. Two recesses, both of which are generally indicated at 106 in Figure 3, are formed in the body 102. The inclusion of two recesses 106 desirably allows accommodation of two communication lines by the receptacle module 100.

A cross sectional view of one of the recesses 106 is provided in Figure 2. Figure 2 also shows the plug 10 inserted into the recess 106. The recess 106 has a first open

end and a second closed end. When an RJ-xx series plug is inserted into the recess 106, a plurality of conductors 108 communicates with one of its respective contacts 20. The conductors 108 are preferably spring-like so that they are in
5 firm electrical continuity with the contacts 20. In some applications only two conductors 108 are provided while more than two conductors 108 are provided in other applications. Each of the conductors 108 is joined to a respective hollow pin, one of which is shown in cross section at 110, which
10 mates with corresponding pins provided in the female coupling (120 in Figure 1).

It will be appreciated that the number of pins and conductors can be varied in accordance with the particular application for the receptacle block. Moreover, it is within
15 the scope of the present invention to utilize any techniques now available, or which become available in the future, to provide electrical connection between the conductors in the recesses and the coupling structure.

Still referring to Figure 2, as the plug 10 is received
20 into the recess, a ledge 104 provided on the biased clip 12 engages a ridge 18 formed on the body 102 and protrudes into

the recess 106. The biased clip 12 and the ledge 104 cooperate to hold the plug 10 in the recess 106. When removal of the plug 10 is desired, the biased clip 12 is compressed and the plug 10 is removed from the recess 106.

5 Enclosing one end of the recess is an expandable member 114. In the embodiment of the invention represented in Figure 2, the expandable member is an elastic and stretchable membrane. The expandable member 114 is preferably a rubber-like material which is an electrical insulator. The
10 expandable member 114 is anchored in a groove 116 provided in the body 102 around the recess 106.

As clearly shown in the cross section of Figure 2, when the plug 10 is fully inserted into the recess 106 the expandable member 114 is moved to expand the depth of the
15 recess 106. The expandable member 114 isolates the contacts 20 from exposure to the surrounding environment. If the expandable member 114 were not included, as in the previously available schemes, the contacts 20 would be exposed to the surrounding environment and the possibility that the contacts
20 20 will be shorted together is present. It is also possible that the contacts 20 could be shorted to an electrical ground,

pass a current to a user who touches the contacts 20, or some other event might occur which would damage the communications devices attached to the cable 14. As known in the art, voltages of more than 70 volts regularly are present on the
5 contacts 20 when connected to the common carrier telephone network in the United States.

The illustrated expandable member 114 is preferably fabricated from a rubber-like material which is flexible enough to allow the end of the plug 10 to expand the flexible
10 member 114 without undue force being exerted on the plug 10. The material from which the expandable member 114 is fabricated should be strong enough to allow long time use without any failure, e.g., tearing. Those skilled in the art will appreciate that the perimeter of the expandable member
15 114 should be securely anchored in the groove 116.

It is to be understood that structures other than the expandable member 114 can function as the expandable means for isolating the contacts 20 from electrical continuity with any object in the surrounding environment. For example, a
20 combination of rigid panels joined together to allow expansion can function as the expandable means. Further, a combination

of rigid elements and elastic elements, or one or more rigid elements which fold within the thickness of the body 102, can be devised using the information contained herein. It is preferred that the thickness of the body 102 be not greater
5 than the thickness of the modem card 118. Thus, the expandable member 114 should tend to automatically return to within the plane of the body 102 once the plug 10 is removed and/or allow the user to collapse the expandable member 114.

Referring to Figure 3, it is preferred that the recesses
10 106 have particular dimensions. It is preferred that the two unbroken side walls of the recess each have a length in the range from about .265 inches to about .285 inches and the single remaining straight wall, which is perpendicular to the two side walls, have a dimension in the range from about .45
15 inches to about .475 inches for compatibility with RJ-45 plugs. It is also preferred that the two unbroken side walls of the recess have a length in the range from about .265 inches to about .285 inches and the single remaining straight wall, which is perpendicular to the two side walls, have a
20 dimension in the range from about .375 inches to about .4 inches for compatibility with RJ-11 and RJ-12 plugs.

Figure 4 is a perspective view of a second embodiment of the present invention with a receptacle module, generally represented at 131. The receptacle module 131 is illustrated in Figure 4 as being retracted into a communications card 130.

5 The communications card 130 can house any of the communications devices indicated earlier.

The receptacle module 131 includes a body 132 and a finger pull 148 formed thereon. The receptacle module 131 is conveniently kept in its retracted position illustrated in
10 Figure 4 until the communications card 130 needs to be connected to a communications line (not shown in Figure 4). When needed, the user grasps the finger pull 148 and pulls the receptacle module 131 to its extended position represented in Figure 5.

15 Figure 5 illustrates the receptacle modules in its extended position. The receptacle module 131 includes a pair of ridges (one shown in phantom image at 140 in Figures 4 and 5) which extend from the sides of the receptacle module 131 and which slide along a pair of grooves, shown best in phantom
20 image in Figure 5 at 138.

The receptacle module 131 includes two recesses, each generally indicated at 134, with each recess including a plurality of conductors 146. Each recess 134 also preferably includes an expandable member 144 which can be identical,
5 similar, or equivalent to the expandable member 114 discussed in connection with Figures 1-3.

Figure 6 is a perspective view of a third embodiment of the present invention including a removable receptacle module generally represented at 151. The removable receptacle module
10 151 is shown in place in a communications card 150 as has been explained earlier. The removable receptacle module includes a body 166 which is illustrated in Figure 6 in a retracted position. It will be appreciated that the retracted position illustrated in Figure 6 can be used or the body 166 can be
15 fully withdrawn into the communications card 150 housing. In order to use the apparatus, a user preferably grasps finger grips 166 and pulls the body 166 out to an extended position as represented in Figure 7.

The removable receptacle module 151 is advantageously
20 easily removable from the communications card 150. In order to remove the entire removable receptacle module 151 from the

communications card 150, a pair of wings 158 are squeezed inwardly so a ledge (158 in Figure 8) provided on each wing 158 disengages from an edge 162 of the communications card 150 housing. The entire removable receptacle module 151 can then
5 be removed from the communications card 150. It will be appreciated that other structures can carry out the function of the wings 158, as will be explained later in this disclosure.

It is common for a receptacle module, such as receptacle
10 module 100, to be broken or damaged during use. If a receptacle module, or other structure providing connection to a communications line is permanently affixed to the communications card or its equivalent, then the only practical recourse is replacement of the entire communications card,
15 even though only the receptacle module has been damaged. The embodiment of the present invention represented in Figures 6-9 provides that the receptacle module can be easily replaced in case of damage.

Moreover, the removable receptacle module 151 can be
20 replaced with another removable receptacle module which is adapted to receive another size or style of plug (not

represented in Figures 6-9). For example, the RJ-11, RJ-12, and RJ-45 connectors have all been generally adopted for specialized applications. Thus, a removable receptacle module adapted for use with RJ-11 plugs can be easily replaced with
5 a removable receptacle module adapted for use with RJ-45 plugs and so forth.

Figures 8 and 9 provide detailed views of the removable receptacle module 151 with the body 166 in an extended and retracted position, respectively. Provided in the body 166
10 are a pair of recesses, generally indicated at 154, and a plurality of conductors 156. Each recess 154 preferably includes an expandable member, generally indicated at 154, as has been previously explained.

As represented in Figures 8 and 9, the removable
15 receptacle module 151 includes a shell 168 from which the wings 156 extend and in which the body 166 slides. It will be appreciated that many different structures can be devised by those skilled in the art to carry out the functions of the shell using the teachings contained herein. Attached to the
20 body 166 are three guides 172 which slide within three respective grooves 170. The guides 172 and the grooves 172

are configured so that the body 168 is held captive in, i.e., cannot be completely removed from, the shell 168. Also represented in Figures 8 and 9 are a plurality of electrical conductors indicated at brackets 174 which mate with suitable structures within the communications card 150 housing to allow transfer of signals between the communications line (not illustrated in Figures 8 and 9) and the communications card (150 in Figures 6 and 7).

It will be appreciated that since the housing 168 of the receptacle module 151 is retained within the communications card 151, and that the communications card 150 is held within a lap top computer or a cabinet of some kind, the shell 168 is protected from breakage and damage so it can be removed without undue difficulty even if damage does occur to other components of the removable receptacle module 151.

Figure 10 provides a perspective view of a fourth embodiment of the present invention. The embodiment illustrated in Figure 10 includes a receptacle module, generally indicated at 181, illustrated in a retracted position. The receptacle module 181 includes a body 184 which is preferably semicircular in shape and rests, when in its

retracted position, within a cavity in a communications card
180, the cavity being generally indicated at 182 in Figure 11.
The cavity 182 is preferably semicircular in shape but can be
any shape which provides sufficient room to accommodate the
5 body 184 in its retracted position.

The body 184 is attached to the communications card 180
housing by way of a pivot 186. The pivot 186 allows the body
184 to be rotated by pulling on a finger grip 188 to an
extended position as illustrated in Figure 11. In its
10 extended position, the receptacle module 181 allows access to
a recess 190 which is preferably configured as explained
earlier and is ready to receive a plug, such as plug 10 in
Figure 1. Electrical connections between the conductors (not
illustrated) disposed in the recess 190 and the circuitry
15 contained in the communications card 190 are provided as can
be designed by those skilled in the art. Those skilled in the
art can also arrive at numerous structures which are
equivalent to those illustrated in Figures 10 and 11 using the
teachings contained herein.

20 Figure 12 provides a perspective view of a fifth
embodiment of the present invention which includes a

receptacle module, generally indicated at 200, with male couplings 204 similar to those represented in Figures 1-3 at 112 and which are received by a communications card such as those described earlier. A body 202 is provided with a recess
5 into which the plug 10 is inserted. As illustrated best in the cross sectional view of Figure 13, a plurality of conductors 206 are provided which communicate with respective contacts 20 on the plug 10.

With the plug 10 in position on the body 202, a lever 208
10 holds the plug 10 in place. The lever 208 is biased toward the body 202 by a spring 210. A ledge 212 provided on the lever 208 engages the ridge (18 in Figures 2 and 3) provided on the clip 12 to further hold the plug in place. An aperture is provided on the lever 208 to accommodate a hump 22 which is
15 provided on plugs which comply with the RJ-xx series standards. It will be appreciated that the biased lever provides a much more secure and convenient to use apparatus than any of those available in the art which are suitable for use with RJ-xx series plugs and which is suitable for use with
20 miniaturized devices such as the previously described communications cards.

Reference will next be made to Figure 14. Figure 14 provides a perspective view of a preferred sixth embodiment of the present invention. The embodiment of Figure 14 provides a communications card 250 which includes a replaceable direct
5 access arrangement 258 which is shown ready to be inserted into the communications card 250. As is known in the industry, the communications card 250 makes electrical connection to a computing device via connector sockets, which are represented at 252 in Figure 14.

10 The inclusion of a replaceable direct access arrangement, also referred to as a data access arrangement (abbreviated "DAA"), provides important advantages not previously available in the industry. In the past, DAAs provided a few functions such as: matching the impedances between the telephone line
15 and the modem; receiving data from the telephone line; transmitting data onto the telephone line; providing a pulse dial; and detecting an incoming ring signal. Significantly, different countries and regions of the world require that the DAA carry out different functions.

20 Presently, it has become a practice in the industry to supply a DAA with a modem in accordance with whatever country

incorporation into a communications card which is used with a portable computer.

The present invention solves these problems found in the industry by including a replaceable DAA 258 which is received
5 into a cavity which is generally indicated at 254 in Figure 14. The replaceable DAA 258 not only can carry out the customary functions already known in the art, but in accordance with the present invention the replaceable DAA 258 can also carry out other desirable functions as described
10 herein.

The replaceable DAA 258 preferably makes electrical connection with the communications card 250 via twenty connector pins 256 provided in the back of the cavity 254 and corresponding connector sockets 260 provided on the rear of
15 the DAA 258. As necessary, a user can install an appropriate replaceable DAA 258 to perform the functions necessary to obtain direct connection to a country's telephone system or to perform some other function.

It will be appreciated, and as will be explained shortly,
20 the replaceable DAA 258 can house components different than those necessary to connect to a telephone line such as

providing the components necessary to interface with a computer network or provide wireless communication service such as cellular telephone service or carry out some other function.

5 Represented in Figure 14 are grooves 255 into which are received respective ridges 262 provided on the sides of the replaceable DAA 258. The grooves 255 are more clearly represented in the end view of Figure 14A. The grooves 255 and the ridges 262 function to guide the replaceable DAA 258
10 into and out of the cavity 254. The replaceable DAA 258 is preferably held in the cavity 254 by a pair of flexible ledges 264 which engage corresponding notches 257 provided on the inner surface of the cavity 254. Figure 14B illustrates the communications card 250 when the replaceable DAA 258 is fully
15 inserted into the cavity 254.

To remove the replaceable DAA 258 from the remainder of the communications card 250, a pair of tabs 266 are squeezed, resulting in the ledges 264 being released from the notches 257, and allowing the replaceable DAA 258 to be extracted from
20 the cavity 254. It will be appreciated that many different arrangements can be arrived at by those skilled in the art to

allow the components of the replaceable DAA 258 to be connected to, and removed from, the remainder of the communications card 250.

5 The replaceable DAA 258 illustrated in Figure 14 is provided with a receptacle module 270 which is provided with a pair of RJ-xx series receptacles represented at 278A&B which are adapted to connect to a communications line having a RJ-xx series plug such as those represented in Figure 1-3. It will be appreciated that the RJ-xx series receptacles 278A&B can be
10 provided with the expandable member 114 shown in Figure 2 if desired. It is within the scope of the present invention to provide the receptacle module 270 with structures to allow its removal as shown in Figure 1 or to include structures to allow extension out of, as shown by the phantom image of Figure 14,
15 the replaceable DAA 258 and retraction into the replaceable DAA 258 in the direction of arrow 272 as represented in Figure 14B.

Figures 14C-E are high level block diagrams illustrating some of the preferred functions carried out by the replaceable
20 DAA 258. As suggested above, a number of different replaceable DAA 258 units can be provided, each being adapted

to carry out a particular function and the user changing the replaceable DAA 258 as necessary. Provided below in Tables A-C are descriptions of the preferred functions carried out by the blocks represented in Figures 14C-E, respectively.

5

Table A - Figure 14C US DAA	
274A	Modem connection
274B	Hybrid circuit
274C	AC impedance network
274D	Signal transducer
274E	Line connector
274F	Transient protection
274G	Loop relay
274H	DC holding current
274I	Ring detect circuit

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Table B - Figure 14D Norway DAA	
275A	Modem connection
275B	Hybrid circuit
275C	AC impedance network
275D	Signal transducer
275E	Loop relays
275F	Transient protection
275G	Line connector
275H	Pulse dial
275I	DC holding current
275J	Ring detect

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15

Table C - Figure 14E German DAA	
276A	Modem connection

[illegible]5

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Figure 14F shows a receptacle module 270A which includes only a single RJ-xx series receptacle. Some country's regulations require that only a single telephone line be connected to a telecommunications device. The RJ-xx series

receptacle illustrated in Figure 14F is preferably an eight conductor RJ-45 receptacle. The DAA to which the receptacle module 270A is connected preferably provides the interfacing functions needed to directly attach to the telephone system of the particular country or countries.

Reference will next be made to Figures 15A-D which are detailed views of the receptacle module 270 and the structures which allow the receptacle module 270 to extend out of or retract into the replaceable DAA 258 (shown in Figure 14). It will be appreciated that the structures which allow extension and retraction of the receptacle module 270 can be incorporated into the replaceable DAA 258, directly into a communications card 250, or into any other device which would benefit from the compact communications connector described herein.

Prior to the present invention, if the structures providing RJ-xx series connectors were affixed to the PCMCIA communications card, the connectors would be broken off or damaged and the user would be required to discard the entire communications card and would be stranded with an inoperative communications card. The devices described in U.S. Patent No.

5,183,404 to Aldous are particularly afflicted by this problem. Prior to the advent of the instant invention, the industry had not recognized the described incidents as a significant problem and the industry has not been able to arrive at the solution described herein.

The present invention allows the structures which provide the communications receptacles to be readily replaced by the user. The user may need to replace the structures which provide the communications receptacles due to damage or in order to interface with different communications lines or devices. The present invention provides these advantages which have not otherwise been available in the industry. Thus, the user can replace damaged receptacle structures, or replace the structure if other functions are necessary, quickly and without any difficulty.

Represented in Figures 15A and 15B is a receptacle module 270 which includes two RJ-xx series receptacles, generally represented at 278A&B. Figure 15A shows the receptacle module 270 in its retracted position. Figure 15B shows the receptacle module 270 in its extended position. Each of the RJ-xx series receptacles 278A&B is provided with four

conductors represented at bracket 284. It will be understood that the representation of the RJ-xx series receptacles 00described herein is exemplary of one presently preferred application with inclusion of other types of connectors and
5 devices also being within the scope of the present invention.

A frame 280 is shown in Figures 15A&B. The frame 280 is, for example, received into a cavity (not represented in Figures 15A&B) provided in the replaceable DAA 258 and is held in place by locking ridges 290 which engage notches 273
10 (Figure 14). An electrical connector represented at 282 in Figure 15A-B provides electrical connection and provides further physical stability and can be selected by those skilled in the art using the information provided herein. The frame 280 is removed from the replaceable DAA 258 by the user
15 squeezing together tabs 292 and the frame 280 being pulled from the replaceable DAA 258. It will be appreciated that the structures represented in Figures 15A&B can be incorporated into many different devices which are now available in the industry or which may become available in the future.

20 As represented in Figures 15A&B, the receptacle module 270 is biased in its extended position by springs 286. The

5 springs 286 are held in place by posts 286A and 286B. A flexible interconnecting circuit 288 provides electrical connection between the connector 282 and the conductors 284. Further information regarding the interconnecting circuit 288 will be provided in connection with Figures 15C&D. As will be appreciated by those skilled in the art, the structures described herein provide the advantage of being more compact than previously possible following conventional teachings in the art.

10 Figures 15C&D show a flexible interconnecting circuit 288 which provides a plurality of conductors indicated at 288A. The flexible interconnecting circuit 288, rather than utilizing pin and socket terminal connections, relies on surface mount connections thus making the structures more compact. The electrical signals received at the connector 282 (Figures 15A&B) are conveyed to conductors (not illustrated) formed on the surface of a bar 289 and a holding clip 291 presses the conductors 288A onto the appropriate conductors formed on the surface of the bar 289. The flexible interconnecting circuit 288 bends as necessary to accommodate the extension and retraction of the receptacle module 270.

To make a surface electrical connection with the conductors of the RJ-xx series receptacles, the conductors 284 p0being held in place by a member 271, the flexible interconnecting circuit 288 is folded so that the conductors
5 288A are pressed against a corresponding conductor represented at 284. The flexible interconnecting circuit 288 is held in place on the member 271 by a clip 277. The receptacle module 270 can provide electrical interconnection between the conductors 284 of the RJ-xx series receptacles 278A&B. Using
10 the described structure, a reliable and compact arrangement is provided to make electrical connection with the RJ-xx series receptacles.

Referring again to Figures 15A&B, a pair of flexible arms 279 are each provided with a protruding knob 281 which is
15 received into a groove formed in the inner surface of the frame which allows the receptacle module 270 to slide within the frame 280 and hold the receptacle module 270 in either its extended or retracted position. Projecting from the side of the receptacle module 270 are wings 282 which provide further
20 positional stability. The leading edge 282A of the wings 282 abuts a stop 283 on the frame to limit the extension motion of

the receptacle module 270. The operation of the flexible arms 279 in the retraction and extension movement will be explained in further detail by reference to Figures 16A-D.

Figure 16A is a side view of the inner surface of the frame 280 showing a groove 306 formed therein and the receptacle module 270 in its retracted position. As can be seen in Figure 16A, the knob 281 is held in a trough 306A. The shape of the knob 281 and the shape of the trough 306A, together with the biasing action of the springs (286 in Figures 15A&B), keep the knob 281 in the trough 306A. When extension of the receptacle module (270 in Figures 15A&B) is desired, the user pushes in on the receptacle module 270 so that the sloping rear side of the knob 281 causes the free end of the flexible arm 279 to bend upward allowing the knob 281 to escape the trough 306A and move forward in the groove 306 to the extended position represented in Figure 16B. Figure 16C provides a side view of the flexible arm 279 showing its vertical movement as represented by arrow 308. Figure 16D provides a top view of a portion of the receptacle module 270 further showing the shape of the knob 281 and the horizontal movement of the flexible arm 279. It will be appreciated that

the described structures provide a simple and reliable arrangement for extending and retracting the receptacle module 270 and which advantageously is more compact than previously available structures. By making the retraction and extension structures more compact, more room is provided for other components.

Reference will next be made to Figures 17A-C which illustrate in detail additional structures which allow the receptacle module 270 to extend out of or retract into the replaceable DAA 258 (shown in Figure 14) and the electrical interconnection between the connector 287 and the conductors 284 in the RJ-xx series receptacles. Many of the structures represented in Figures 17A&B are the same as the correspondingly numbered structures represented in Figures 15A&B. Thus, only the differences between the represented structures will be described.

Represented in Figures 17A&B is one of at least two exposed conductors represented at 294A which is attached to the inner surface of frame 280. Figure 17C shows two sliding electrical contacts 296A and 296B. The sliding electrical contacts 296A&B are preferably of the spring type to ensure

that each of the sliding electrical contacts 296A&B makes solid electrical contact to each of the respective conductors, one of which is represented at 294A in the top views of Figures 17A&B. An electrical connection is made from the
5 sliding electrical contacts 296A&B, through the receptacle module 270, and to the appropriate conductor 284. It will be understood that many variations on the electrical interconnection structures can be carried out within the scope of the present invention using the information set forth
10 herein.

Figures 18A&B will be referred to next to describe the structures which allow the receptacle module 270 to extend and retract. Figure 18A is a cross sectional top view of the receptacle module 270 showing a groove formed therein. Still
15 referring to Figure 18A, provided on the inner surface of the stop 283 is a pin 301 which is held in a recess 304 and biased outwardly from the recess 304 by a spring 302. In Figure 18A, the solid image of the stop 283 and the pin 301 shows their position in the groove 300 when the receptacle module 270 is
20 in its extended position. The biasing force of the spring

286, partially represented in Figures 18A&B, holds the receptacle module 270 in its extended position.

Reference will now be made to both Figures 18A and 18B to explain the movement of the receptacle module 270 from its extended position to its retracted position. When the
5 receptacle module 270 is to be moved to its retracted position, the user (not represented in the figures), pushes the receptacle module 270 toward the frame 280. The pin 301 travels in the groove 300 up the ramp 300A and into the well
10 300B where the pin 301 is held. The retracted position of the receptacle module 270 is represented by the phantom image in Figure 18A. To move the receptacle module 270 from its retracted position to its extended position, the user again pushes the receptacle module 270 inward toward the frame 280
15 which causes the pin 301 to move out of the well 300B up a ramp indicated by arrow 300C. The user then releases the receptacle module 270 which allows the receptacle module 270 to extend and the pin 301 to travel down a ramp indicated by arrow 300D where the pin 301 again enters groove 300 and the
20 receptacle module 270 completes its extension.

Reference will next be made to Figures 19A-C. In order to accommodate wireless communication between the communications card and a wireless communication system, an antenna is provided on the communications cards represented in
5 Figures 19A-C. The embodiments of the present invention illustrated in Figures 19A-C are particularly adapted for accommodating cellular telephone signals but those skilled in the art can readily adapt the embodiments to accommodate other communication systems, including those utilizing radio
10 frequency techniques as well as other mediums.

Figure 19A illustrates an antenna 312 which pivots into and out of the end of the communications card 250 in the directions of arrow 312A. When use of the antenna is desired, the user depresses a release button 315 which allows the
15 antenna to pivot out of the end of the communications card.

Figure 19B illustrates an antenna 318 which is pivotally mounted on a retractable block 314. When use of the antenna is desired, the user depresses a release button 315 which allows the antenna 318 to pivot in the directions of arrow
20 318A. The retractable block 314 can be stored within the communications card and extended and retracted in the

directions of arrow 314A and released from its retracted position by depressing button 316.

Figure 19C illustrates an antenna 322 which is pivotally mounted on a retractable block 320. The retractable block 320 is extended by depression of button 316. When the retractable block 320 is extended, the antenna 322 is pivoted up or down in the direction of arrow 322A. Also provided on the retractable block 320 is a receptacle 324 allowing a communications line to also be attached thereto.

Each of the arrangements represented in Figures 19A-C can be best adapted for use with particular types of antenna which may assume shapes and sizes very different than the illustrated antennas. For example, antennas which are vertically polarized, horizontally polarized, or circularly polarized can have application with the embodiments of the present invention. Moreover, the antennas used with the embodiments illustrated in Figures 19A-C can include components which extend or further pivot to increase the length of, or change the shape of, the antenna. Those skilled in the art will appreciate that the components necessary to carry out wireless communication, such as cellular telephone

communication, can be packaged in the communications card 250
or in a DAA adapted for such purpose. Further information
regarding wireless computer networks can be obtained from IEEE
802.11 Standard (and any available drafts thereof) which is
5 now incorporated herein by reference in its entirety.

Reference will next be made to Figure 20 which shows a
communication card 250 and a replaceable DAA 332 which are
adapted to interface with a portable cellular telephone via a
cable 334 and a connector 336 which attaches directly to a
10 corresponding connector (not illustrated) on the portable
cellular telephone (not illustrated). It will be appreciated
that those skilled in the art will be able to provide
replaceable DAAs 332 and connectors 336 which are adapted to
function with any number of cellular telephones or other
15 communications devices and which allow the user to easily and
quickly change the application to which the communications
card is put.

Reference will next be made to Figure 21. Figure 21
provides a perspective view of a communications card generally
20 designated 340. The communications card 340 follows the
PCMCIA (also referred to as PC Card) Type III standard for

dimensions and configuration. The height of a PCMCIA Type III card is still not great enough to allow a standard RJ-xx series receptacle to be mounted therein. In the communications card 340 illustrated in Figure 21, a T-shaped cutout 328 is removed from the housing of the communications card 340. The T-shaped cutout 328 accommodates the biased clip 12 and the ridge 18 present on the plug 10. The shape of the T-shaped cutout 328 engages the biased clip 12 and the ridge 18 to hold the plug 10 in place. Represented in Figure 21 are two receptacles, each generally designated at 326. Preferably, one of the receptacles 326 is an eight conductor RJ-45 receptacle, which is called for in some computer network standards, and the other of the receptacles 326 is an RJ-11 receptacle. As can be seen in the figures, and particularly in Figure 21, the PCMCIA Type III PC card 340 includes an upper surface 350 and a lower surface 352 which form a portion of the housing for the communication card 340. Also represented in Figure 21 is a connector 338 which can be used to make a connection to another communication device (in a manner similar to that described in connection with connector 336 illustrated in Figure 20), as is known in the art.

Reference will next be made to Figure 21A which shows all of the structures represented in Figure 21 with the inclusion of a cover 342 which shields the T-shaped cutouts 328 and the receptacles 326. The cover 342 is preferably a thin membrane-like material which is attached to, or integral with, the upper surface. The cover can preferably be fabricated from a material having a thickness in the range from about .001 inch to about .050 inches thick such that the card 340 maintains compliance, or substantial compliance, with the pertinent PCMCIA card physical thickness standard. It is also within the scope of the present invention to fabricate the cover 342 from an elastic material. Moreover, the cover 342 can be structured to straddle the entire upper surface 350 of the PC Card 340, or just a portion of the upper surface 350, as deemed best for the particular application of the invention.

Reference will next be made to Figure 22. Figure 22 is a perspective view of another communications card, generally indicated by the bracket 351, in accordance with the present invention. The communications card 351 preferably follows the PCMCIA (also referred to as PC Card) Type III standard for dimensions and configuration. The communications card 351 has

X a plurality of RJ-xx series receptacles 358A-C which are each provided with a pivoting cover, one of which is indicated at

362. The pivoting cover 362 pivots about pin 364 as represented in Figure 22.

5 The communications card 351 include two major components, a card body 351B and a connector housing 351A. Many of the embodiments of the present invention described hereinafter will have a similar structure and the description provided now will apply to all similarly structured embodiments. The card

10 body 351B includes a front end 370 which provides connector sockets in accordance with the PCMCIA standard. The connector housing 351A provides the necessary physical/electrical components to connect to one or more communications lines.

15 For example, the connector housing 351A includes RJ-xx series receptacles 358A-C and an auxiliary connector, generally

wireless (indicated at 359, which preferably can be a connector suitable for coupling to a wireless communications device, for example a portable telecommunications device which complies with the

20 standard. The connector housing 351A also preferably includes

the DAA components such as those described earlier and others which perform similar functions.

DAA

The connector housing 351A can be removed from the card body 351B and replaced with another connector housing 351A in case a connector housing 351A becomes damaged, if another DAA is needed by a user, and/or if different connectors are needed. It is also to be appreciated that the card body 351B and connector housing 351A arrangement illustrated in Figure 22 provide advantages even if the distribution of components is different than that preferably described herein, for example, if the DAA is located in the card body 351B rather than in the connector housing 351A.

Still referring to Figure 22, to provide a secure mating between the card body 351B and the connector housing 351A, a female portion 353B receives a male portion 353A when the connector housing 351A is mated to the card body 351B. Moreover, the structure of the electrical connector which provides for communications between the card body 351B and the connector housing 351A, comprising a connector receptacle 354B and a connector plug 354A, further enhances the physical and electrical connection between the card body 351B and the

connector housing 351A. Two spring fingers 356B are received by recesses, one of which is represented at 356A, to further secure the card body 361B and the connector housing 351A together. It is to be appreciated that the structures illustrated in Figure 22, and the other figures herein described, are merely exemplary and many different connector configurations can be used within the scope of the present invention.

When the connector housing 351A and the card body 351B are joined together, and the communications card 351 is received into a computing device, communications via a communications line, such as that shown connected to the RJ plug 10, is ready to occur. A pivoting cover, such as that represented at 362, is provided for each one of the RJ-xx series receptacles 358A-C. The RJ-xx series receptacles 358A-C can be fabricated to receive any of the RJ-xx series plugs, such as RJ-11, RJ-12, and RJ-45 plugs. With the pivoting covers in the closed position, the components of the connector housing 351A are protected and the overall length of the communications card 351 is reduced. When the pivoting cover, for example pivoting cover 362, is moved in the direction of

arrow 360, the RJ plug 10 can be inserted into the recess
formed by the pivoting cover 362. A ledge 366 engages the
biased clip 12 and holds a plurality of spring conductors 368
located in the recess
in electrical contact with the corresponding contacts in the
RJ plug 10 when inserted therein.

Those skilled in the art will readily be able to arrive
at numerous alternative structures capable of providing the
electrical functions required by the connector housing 351A
and the card body 351B using the information set forth herein
and known in the industry. Thus, when the pivoting cover 362
is open as illustrated in Figure 22, an RJ plug is inserted
therein and communications via a communications line can
efficiently occur.

Reference will next be made to Figure 23. Figure 23 is
a perspective view of another communications card, generally
indicated by bracket 374. The communications card 374
includes many of the structures described in connection with
communications card 351 illustrated in Figure 22. Thus, only
the different and/or additional structures will be discussed
in connection with the communications card 374 represented in
Figure 23.

As shown in Figure 23, a card body 374B and a connector housing 374A are included in the communications card 374. The connector housing 374A includes three RJ-xx series receptacles which are contained in sliding drawers, generally indicated at 5 376A-C. The sliding drawers 376A-C each include a drawer front, one of which is shown at 378, and drawer sides, represented at 380. Drawer ridges, one of which is shown at 380A, are provided on the drawer sides 380 and are one example of a structure which can be used to allow the sliding drawers 10 to retract into, and extend from, the connector housing 374A. When the sliding drawers 376A-C are in their closed position, the internal components of the connector housing 374A are shielded from damages and contamination.

As represented in Figure 23 at sliding drawer 376A, when 15 an RJ plug 10 is to be connected, the sliding drawer 378 is extended from the connector housing 374A, and the RJ plug 10 is inserted therein at an angular orientation as represented in Figure 23. The sliding drawers 376A-C include structures to hold the RJ plug 10 at the preferred angular orientation 20 when the RJ plug 10 is inserted therein. As the RJ plug 10 is received into the sliding drawer 376A the biased clip 12

engages a ledge 384 which holds the electrical contacts of the RJ plug 10 in continuity with a plurality of conductors, indicated at 382 in the sliding drawer 376A. Those skilled in the art will readily be able to arrive at numerous different structures which provide the electrical functions to be carried out by the connector housing 374A and the card body 374B using the information set forth herein and known in the industry. When the communications card 374 is not being used, all of the sliding drawers 376A-C are closed and components of the connector housing 374A are protected from damage and the overall length of the communications card 374 is preferably and substantially within the PCMCIA Type III standard. Desirably, as is the case with the other embodiments described herein, the components which carry electrical current from the communications line are shielded from contact with structures in the surrounding environment thus preventing the contacts from being inadvertently shorted together or shorted to ground or conveying current to a human being.

Figure 24A will be referred to next to describe another communications card within the scope of the present invention, generally indicated at 390. Figure 24A is a perspective view

of the communications card 390 which includes a plurality of RJ-xx series receptacles positioned in sliding drawers, the sliding drawers being generally indicated at 394A-C, with each of the sliding drawers 394A-C being provided with a movable
5 bottom 400 which functions to shield electrical conductors 398 from contact with the surrounding environment. A card body 392 preferably includes the components necessary to provide the communications functions which are desired by the user and which can be arrived at by those skilled in the art using the
10 information set forth herein and using the information readily available in the industry.

As shown best in Figure 24B, which is a cross sectional view taken along line 24B-24B of Figure 24A, the structure of the sliding drawers 394A-C each include a movable bottom 400.
15 Figure 24B shows the movement in the direction of arrow 402 of the movable bottom 400 to shield the electrical conductors 398 when there is no RJ plug present and the position of the movable bottom 400 when an RJ plug is received into the recess, two of which are indicated at 396A&B in Figure 24A,
20 when an RJ plug is received therein.

As will be appreciated from an examination of Figure 24A, the recesses 396A&B include structures, such as ledges 393A&B, to engage the biased clip of the RJ plug. Also as shown in Figure 24A, the moveable bottom 400 preferably includes a bevel 404 to urge the movable bottom 400 in an upward position when the sliding drawers 394A-C are moved into their retracted position.

Reference will next be made to Figure 25. Figure 25 is a perspective view of a further communications card, generally indicated at 420, in accordance with the present invention. The communications card 420 includes a plurality of RJ-xx receptacles, generally indicated at 422A-C, each formed by a pair of retractable and expanding jaws, two of which are represented at 424A&B. When in the retracted position, as shown with RJ-xx receptacles 422B&C, the communications card p0420 (including card body 420B and connector housing 420A) substantially complies with the dimension requirements of the PCMCIA Type III standard. Included in the connector housing 420A are the structures which allow the jaws 424A&B to be extended out of and retracted into the connector housing 351A in the directions of arrow 432 and also to pivot in the

directions of arrows 430 as well as to bias the jaws 424A&B toward each other.

An RJ plug 10 represented in Figure 25 is received into the receptacle 422A formed by the jaws 424A&B by manually separating the jaws 424A&B and inserting the RJ plug 10 between the jaws 424A&B. The jaws 424A&B are biased toward each other thus capturing the RJ plug 10 therein and holding the electrical contacts of the RJ plug 10 in continuity with the conductors, one of which is represented at 428, in the jaw 424A. A ledge 426 engages the biased clip on the RJ plug 10 to further secure the RJ plug 10 in position in the jaws 424A&B. The structures represented in Figure 25 provide that the RJ plug 10 and the communications card 420 can be easily connected and disconnected and that the internal components of the communications card 420, including the conductors 428, are shielded from the surrounding environment.

Figure 26A is a partial perspective view of a communications card generally indicated at 440 which includes two different connectors, an RJ-xx series receptacle generally indicated at 442 and an auxiliary connector, generally indicated at 448, which preferably can be a connector suitable

for coupling to a wireless communications device, for example a portable telecommunications device which complies with the GSM communications standard, both of which are positioned on a retractable/extendable member 444. The

5 retractable/extendable member 444 is shown in an extended position in Figure 26A and is shown in a retracted position in Figure 26B. Those skilled in the art can readily arrive at the structures included in the communications card 440 needed to implement the extension and retraction functions of the
10 member 444. The electrical connections included in the communications card 440 can be readily arrived at using the information set forth herein and using the information well-known in the industry.

Reference will next be made to Figure 27. Figure 27 is
15 a partial perspective view of a communications card, generally indicated at 460, in accordance with the present invention. The communications card 460 includes a rotatable and retractable member 462. The rotatable and retractable member 462 includes three RJ-xx series receptacles, generally
20 p0indicated at 464A-C. The RJ-xx series receptacles 464A-C each include conductors, some of which are indicated at 466A-

C, which receive corresponding contacts in the RJ plug 10. Each of the RJ-xx series receptacles 464A-C include a ledge 470A-C which engage the biased clip on the RJ plug with the dimensions of the RJ-xx series receptacles 464A-C being such
5 that the appropriate RJ plug is closely received therein, as is preferred with all of the communications cards described herein. Moreover, as with the other communications cards described herein, the RJ-xx series receptacles 464A-C can be fabricated to receive any appropriate RJ-xx series plugs, for
10 example receptacles 464A and 454C preferably receiving an RJ-11 plug and receptacle 464B preferably receiving an RJ-45 plug.

The rotatable and retractable member 462 rotates in the directions of arrow 468 such that after one or more RJ plugs
15 have been operatively received therein the cords extending from the RJ plug can be oriented in a direction which is 90° (as represented in phantom image at 462A), 180°, 270°, or some intermediate orientation, from the orientation illustrated in Figure 27. One preferred structure to provide for rotation of
20 the rotatable and retractable member 462 is represented by the post 472 with a groove 474 which is engaged by ring 476. The

structures which maintain electrical continuity between the components housed within the communications card 460 are represented at 480 with the structures which provide for the retraction/extension of the rotatable and retractable member 462 are represented at 482, all of which can be readily arrived at using information set forth herein and well-known in the industry. As is the case with many of the embodiments described herein, the features represented in the embodiment of Figure 27 can be implemented in many different platforms, for example PCMCIA Type II and III PC Cards, as well as other platforms known in the industry.

Reference will next be made to Figure 28 which is a perspective view of a communications card, generally indicated at 490, having two RJ-xx series receptacles positioned in a retractable shell, generally indicated at 492. The retractable shell 492 comprises an upper member 494 and a lower member 500. The lower member 500 is slidably joined to the upper member 494 by a pin 504 resting within a slot 502 which allows the lower member to slide in the directions of arrow 514. The lower member 500 is biased toward the upper member 494 by the structures represented at 506. When an RJ

plug is inserted between the upper member 494 and the lower member 500, such that the biased clip on the RJ plug 10 is received by one of the receivers 496A or 496B, the lower member 500 pushes the RJ plug 10 towards the upper member 494 and makes operative contact between the conductors 508 and the corresponding contacts provided in the RJ plug 10.

Provided on the upper member 494 are a plurality of visual indicators 498 which provide an indication of the operation of the communication card 490. The structures which allow the retractable shell 492 to extend and retract in the directions of arrow 510 are represented at 512 with the structures which maintain the necessary electrical coupling being represented at 516. The retractable shell 492 provides for convenient and secure connection to two RJ plugs in accordance with the present invention.

Figures 29A&B will be referred to next. Figures 29A and 29B are a perspective view and a top view, respectively, of another communications card, generally indicated at 530, in accordance with the present invention. The communications card 530 preferably follows the PCMCIA (also referred to as PC Card) Type III standard for dimensions and configuration and

includes a card body 530B and a connector housing 530A. The connector housing 530A includes an auxiliary connector, generally indicated at 544, and an auxiliary slot 540 which can operatively receive a memory card, such as a compact flash memory card, as known in the industry. Further information regarding memory cards adhering to the Compact Flash standard, and to the Miniature Card standard can be obtained from the URLs http://www.mcif.org/spel_1.pdf and http://www.mcif.org/mspec_1.pdf and <http://www.compactflash.org/>, the information contained in all of these URLs as well as the information contained in all links available at such URLs as of the filing date of this application are now incorporated by reference herein in their entireties. The cards adhering to the Compact Flash standard and to the Miniature Card standard are examples of preferred memory cards for use with the present invention.

As represented in Figures 29A&B, a receptacle body 532 which is preferably and substantially semicircular in shape, is provided with two recesses 536A&B which each receive an RJ plug 10. The recesses 536A&B each include a ledge 538A&B such

that the conductors 542 disposed in the recesses 536A&B can make operative connection with the RJ plug 10.

5 The receptacle body 532 is preferably semicircular in shape and pivots about a bolt 534. The bolt 534 allows the receptacle body 532 to be rotated in the directions of arrow 546 to an extended position as illustrated in Figures 29A&B. In its extended position, the receptacle body 532 allows access to the recesses 536A&B. The communications card 530 allows convenient connection to a communications line via an RJ plug 10 and operative connection to a memory card via the slot 540.

10 Reference will next be made to Figures 30A&B which are perspective views of a communications card, generally indicated at 560, in accordance another aspect the present invention. The communications card 560 includes three RJ-xx series receptacles, each generally indicated at 562A-C, positioned on an end of the communications card 560. As shown best in Figure 30B, a shell member 566 is extended from a card body 564 as indicated by arrow 574. When the shell member 566 is in the retracted position represented in Figure 30A, the length of the communications card substantially conforms to

the PCMCIA Type III standard. Also illustrated in Figure 30A are a plurality of contacts 568A-C which are connected to the card body 564 and which make electrical connection with corresponding contacts in the RJ plug 10 (Figure 30B). When the shell member 566 is in the extended position represented in Figure 30B, a clip capture member 572 is dropped into the position indicated in Figure 30B. The clip capture member 572 moves in the directions of arrow 576. When the clip capture member 572 is in its upper position (as represented in Figure 30A), the communications card 560 substantially conforms to the PCMCIA thickness standard. When the clip capture member 572 is in its lower position (as represented in Figure 30B), the RJ plug 10 can be received therein. With the shell member 566 in its extended position (Figure 30B), the contacts provided on the RJ plug 10 impinge upon the corresponding conductors 568C when the RJ plug 10 is inserted into one of the receptacles 562A-C. The communications card 560 is another example of the present invention which provides a convenient connection to one or more RJ plugs which substantially complies the PCMCIA physical dimension standard when not in use, which does not require any additional

proprietary cords or connectors to make the necessary connections, and which shields electrical conductors from the surrounding environment.

Reference will next be made to Figures 31A&B. Figures
5 31A&B are perspective views of a communications card 590 including three RJ-xx series receptacles, generally indicated at 592A-C, and memory card slots, generally indicted at 596A&B which operatively and removably receive memory cards 594A&B, respectively, in the direction of arrow. Those skilled in the
10 art can readily arrive at the necessary hardware and software needed to make an operative connection with the memory cards 596A&B.

Figures 32A&B are perspective views of a PC card 610 which operatively receives a magnetic disk storage medium 614
15 in a slot 614. When inserted into a PC card slot on a computing device so that a front end 618 engages a PC card socket, the internal components, represented at 616, of the PC card 610 provide for data transfer between the PC card 610 (and thus the computing device) and the magnetic disk storage
20 medium 614. It will be appreciated that the optical storage

medium can be used in the place of the magnetic disk storage medium.

One example of the magnetic disk storage medium 614 is the disks used in the klik!™ drive which has been announced by Iomega. Current specifications designate that klik!™ disks (cartridges) will be about 2.16 inches by about 1.98 inches by about .077 inches and which hold 40 MB of data and which are suited for applications which currently require flash memory cards. The klik!™ disks and drive are particularly suited for inclusion in miniature apparatus such as Personal Digital Assistants (PDAs) and other miniature digital electronic devices. Further information regarding the klik!™ disk can be obtained from the URL <http://www.iomega.com/product/klik> and the information contained at the URL and the information contained in all links available at such URL as well as the information contained in all links available at such URL as of the filing date of this application is now incorporated by reference herein in their entireties.

Reference will next be made to Figure 33 which is a perspective view of a PC card, generally indicated at 630, which includes a first slot, generally indicated at 632A, and

a second slot, generally indicated at 632B, each which
operatively receive a memory cards, 636A and 636B,
respectively. The slots 632A and 632B are each provided with
a set of connector pins 634A and 634B which are arranged in
5 accordance with a memory card standard. Internal to the PC
card 630 are the components needed to interface both memory
cards 636A&B to a computing device into which the PC card 630
is inserted. The PC Card 630 preferably adheres to the PCMCIA
Type III standard and desirably allows two memory cards to be
10 simultaneously interfaced with a computing device. Using the
information contained herein, those skilled in the industry
will readily arrive at the hardware and software necessary to
convey data between a computing device in which the PC Card
630 is inserted and one or both memory cards 636A&B.

15 Reference will next be made to Figures 34A&B which are a
perspective view and a detailed perspective view,
respectively, of a communications card generally indicated at
650. The communications card 350 can simultaneously receive
up to three RJ plugs, such as the RJ plug 10 represented in
20 Figure 34B. As shown best in Figure 34A, a cover 652 is
provided with a finger pull 652A and the cover 652 pivots

about an axis 654 in the directions of arrow 660 and as shown
by the phantom image. When the cover 652 is moved to its open
position represented in Figure 34B, three sets of conductors
664 are exposed. The sets of conductors 664 are arranged to
5 correspond to the contacts provided in the RJ plug 10. With
the cover 652 in the position represented in Figure 34B, a
plurality of plug bails 656A-C are lowered to the position
shown in Figure 34B. The bails 656A-C are biased in an upward
direction by spring 662. When an RJ plug 10 is inserted into
10 one of the bails 656A-C, the biased clip 12 engages a ledge
658A-C so that the RJ plug 10 is operatively held in place and
signals can be passed between the RJ plug and the
communication card 650. The communication card 650 allows
more than one RJ plug to be simultaneously and conveniently
15 connected to a computing device.

Reference will next be made to Figure 35 which is a
perspective view of a communications card, generally indicated
at 680, in accordance with the present invention. The
communications card 680 includes a retractable receiver member
20 692 which provides two RJ-xx series receivers, generally
indicated at 684A&B. Each of the receivers 684A&B are

provided with pivoting bails 686A&B which pivot in the
directions of arrow 688. The pivoting bails 686A&B, when in
the position represented in Figure 35, engage the biased clip
and the body of the RJ plug and hold the RJ plug in an
5 operative position so that the conductors, one set of which is
represented at 686A, engage the corresponding contacts
provided on the RJ plug. The receiver member 692 retracts
into, and extends from, the communications card 680 in the
directions of arrow 682. The components housed within the
10 communications card 680 which allow electrical continuity to
be maintained with the conductors 686A as the receiver member
is retracted and extended are represented at box 690.

In view of the foregoing, it will be appreciated that the
present invention provides many different communications line
15 receptacles for use with a miniaturized communications device
wherein the electrical contacts are shielded from the
surrounding environment and which is resistant to breakage and
which can be moved out of the way when not being used. The
present invention also provides communications line
20 receptacles which are easily replaceable if broken. The
present invention also provides communications cards which can